

Michigan Connected and Automated Vehicle Working Group

October 25, 2018

Meeting Packet

- 1. Agenda
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- 3. Attendance List
- 4. Presentations



Michigan Connected and Automated Vehicle **Working Group**

October 25, 2018

Southeast Michigan Council of Governments (SEMCOG)

1001 Woodward Avenue, Suite 1400 Detroit, MI 48226

Meeting Agenda

08:30 AM **Registration and Networking**

09:00 AM **Introduction and Update**

Zahra Bahrani Fard, Transportation Systems Analyst, Center for Automotive Research

SEMCOG Welcome Remarks

Kathleen Lomako, Executive Director, SEMCOG

Creation of a Cyber Security Course for Automotive Technicians

Nelson Kelly Ph.D., Assistant Director, Center for Advanced Automotive Technology,

Macomb Community College

Securing V2X Communications – Can You Spell SCMS?

Mark Peters, Director Automotive Business Development, OnBoard Security

Comparison Between DSRC and C-V2X from a Vehicle and Infrastructure Perspective

Colin Goldsmith, Managing Partner - Engineering Solutions, P3 group

10:30 AM **Networking Break**

10:50 AM **Hot Topics Discussion**

Frank Perry, Principal Consultant, CAV Program Manager, WSP

Katie McLaughlin, Associate Consultant, WSP

Update on MDOT CAV Activities

Collin Castle, ITS Program Manager, Michigan Department of Transportation

How PPPs Are Driving Mobility Pilots in Michigan

Amanda Roraff, PlanetM Operations Manager, Michigan Economic Development

Corporation

12:00 PM **Meeting Adjourned**



Michigan Connected and Automated Vehicle Working Group

October 25, 2018



Attendance List

First	Last	Organization	Position
Alex	Beavan	Oxbotica	Vehicle Integration Engineer
Amanda	Roraff	MEDC	PlanetM Operations Manager
Andrew	Harris	Warwick Manufacturing Group	Principal Engineer
Anthony	Magnan	Verizon	5G Solutions Engineer
Bert	Baker	Great Wall Motors R&D	Program Manager - Autonomous Driving Systems
Bill	Shreck	MDOT	Interdepartmental Liaison
Bradford	Herron	Cohda Wireless	Sales Engineer
brian	daugherty	MEMA	СТО
Charlie	Cheng	Shanghai International Automobile City Group	President
Chase	Chen	AECOM	Traffic Engineer
Christyn	Lucas	Detroit Regional Chamber	Manager, Business Research
Colin	Goldsmith	P3 North America Inc.	Managing Partner
Collin	Castle	Michigan DOT	ITS Program Manager
Dale	Suich	Independent	Analyst
Dan	DuBois	Square One Education Network	CEO
Daniel	Ruiz	Meridan Mobility	CEO



First	Last	Organization	Position		
Danielle	Bowman	Workforce Intelligence Network (WIN)	Project Manager		
David	Hamson	Centre for Connected & Autonomous Vehicles	Deputy Head		
Denise	Donohue	County Road Association of Michigan	Executive Director		
Doug	Plachcinski	Macomb Township	Planning Supervisor		
Eric	Shreffler	MEDC	Managing Director, Auto Office		
Eve	Lerman	US Department of Commerce	Senior International Trade Specialist		
Frank	Perry	WSP	CAV Program Manager		
Gary	streelman	Magneti Marelli	Dir Adv Engr & New Concepts		
Harnet	Teklay	Brandmotion LLC	Connected Vehicle Engineering Intern		
Heinz	Mattern	Magna	Product Director Near Field		
Hossam	Abdel All	Macomb County Department of Roads	Traffic Safety/ITS Engineer		
Jennifer	Moll	U.S. Department of Commerce	Sr. International Trade Specialist		
Jennifer	Jensen				
Jesse	Halfon	Dykema	Attorney		
Jim	Ohlinger	PPG	Product Management		
Joseph	Bartus	Macomb County Department of Roads	Project Engineer-Traffic		
Joshua	Auld	Argonne National Laboratory	Principal Transportation Engineer		
Joshua	Williams	British Consulate Chicago	Head of Automotive		
Julia	Roberts	AAATA/TheRide	Innovative Mobility Planner		
Katie	McLaughlin	WSP	Associate Consultant		
Ken	Zurawski	KJZ Consulting	President		
Ken	Yang	AECOM	Senior Systems Engineer		
Kim	Hill	HWA Analytics	President		
Kristie	Pfosi	Mitsubishi Electric Automotive America	Sr. Manager Automotive Cyber Security		



First	Last	Organization	Position
Kristin	Welch	Bedestrian	Strategy Advisor
Kyle	Dolan	British Consulate Chicag	Head of Science and Innovation
Linos	Jacovides	Michigan State University	Professor
Mark	Peters	Onboard Security	Director Automotive Business Development
Melissa	Wooten	British Consulate Chicago	Vice Consul for Prosperity and Economic Policy
Michael	Talbot	Meridan Mobility Technologies	Head of Strategy
Mitch	Rohde	Quantum Signal, LLC	Big Frog Bossman
Nathan	Voght	Washtenaw County OCED	Economic Development Specialist
Neil	Fulton	Connected and Automated Transport	Director
Nelson	Kelly	Macomb Community College	Assistant Director
Nivas	Dammalapati	Atkins	Project Manager
Peter	Stoker	Millbrook Proving Ground	Chief Engineer-Connected & Autonomous Vehicle
Qiang	Hong	CAR	Senior Research Scientist
Sarah	Binkowski	SEMCOG	Transportation Engineer
Sean	Kelley	Mannik Smith Group	Senior Vice President
Shugang	Jiang	SF Motors	Sr. Manager
Steve	Litz	Powerlink Systems	President
Steven	Lavrenz	Wayne State University	Assistant Professor
Steven	Puuri	Michigan County Road Association	Engineering Specialist
Susan	Proctor	MEDC	Strategic Initiatives Director
Ted	Sadler	Integral Blue	CV Engineer
Terni	Fiorelli	CAR	Industry Analyst
Thomas	Richer	MDOT	ITS Project Engineer
Tito	Lai	Bosch	Marketing Relations



First	Last	Organization	Position		
Tom	Bruff	SEMCOG	Manager Plan & Policy Development		
Wayne	Snyder	NextEnergy Center	Director Technology Development		
Yee Mun	Lee	University of Leeds	Professor		
Zahra	Bahrani Fard	CAR	TSA		



Michigan Connected and Automated Vehicle Working Group

October 25, 2018



Meeting Notes

The Fall 2018 meeting of the Michigan Connected and Automated Vehicle Working Group was held on October 25, 2018 and hosted by the Southeast Michigan Council of Government (SEMCOG), located at 1001 Woodward Avenue, Suite 1400, Detroit, Michigan.

Zahra Bahrani Fard, Transportation Systems Analyst at the Center for Automotive Research (CAR), opened the meeting and detailed the agenda, explained the Michigan CAV Working Group mission, and reviewed noteworthy connected and automated vehicle (CAV) events.

After Zahra's introduction, **Kathleen Lomako, Executive Director of SEMCOG**, welcomed the group and emphasized the importance of emerging technologies including CAV technologies to regional economic growth and future transportation systems. SEMCOG is willing to work with CAV stakeholders on these important topics and will actively incorporate CAV into long-range transportation plans.

Zahra then introduced **Lisa Ouyang**, **commercial specialist at U.S. Consulate General Shanghai**. Lisa informed the audience that her team also manages a CAV working group in Shanghai. The working group primarily consists of U.S. companies based in China (about 15 in total). The objective of this working group is to support U.S. companies' business in China and to keep their leading position in CAV technologies in the overseas market.

Nelson Kelly Ph.D., Assistant Director of Center for Advanced Automotive Technology (CAAT) at Macomb Community College, focused on the creation of a cybersecurity course for automotive technicians at the Macomb Community College. The mission of CAAT is to develop and disseminate advanced automotive technology curricula using seed funding, and to provide outreach activities to middle and high school students. Since automotive technicians are increasingly required to learn new electronic, computer, and experimental testing skills, the 2-year associate degree for vehicle development technician (VDT) could help them a lot. Nelson invited CAR CAV working group members to provide input on the course outline and review course materials when possible using the following link www.autocaat.org.

After Nelson's presentation, Mark Peters, Director of Automotive Business Development at OnBoard Security, addressed the two major challenges of securing V2X communications: 1) authenticity - need to validate that messages are from trusted devices, and 2) privacy – make it difficult to track private vehicles location. Security Credential Management System (SCMS) is therefore needed to ensure the authenticity and integrity of messages. Mark then discussed the SCMS architecture, which includes

policy and technical management, root management, local management, enrollment, certificate batch management, and misbehavior detection. Finally, Mark talked about specific certificate types in the V2X system and SCMS implementation plan. Public documentation on SCMS interface (release 1.2.2) is available online at:

https://wiki.campllc.org/display/SCP/SCMS+CV+Pilots+Documentation

After Mark's presentation, Colin Goldsmith, Managing Partner of Engineering Solutions at the P3 Group, discussed DSRC and C-V2X from vehicle and infrastructure perspectives. Colin first noted the regional focus of CV applications (e.g., mobility in EU and safety and security in the U.S.) and technical approaches (e.g., cellular and V2X in China). These differences are creating competitive marketplaces and uncertainties in terms of how and when transitions will take place to new and/or different technologies. Life-cycle costs will be a key factor. OEMs and suppliers' coordination is important too. Colin then introduced a high-level view of the architecture including RSU types and product scenarios. In conclusion, Colin emphasized the need for V2X vehicle deployment coordination and the importance of monetization strategies & business models that will enable broad deployment of V2X.

Followed by Colin's presentation, Bahrani Fard introduced the representative of the UK AV Test and Development Delegation to the room. David Hamson, Deputy Head at Centre for Connected and Autonomous Vehicles, gave a brief overview of the UK AV Test and Development Delegation activities. The primary goal of the delegation is to advanced and promote autonomous vehicle development, testing and implementation in the UK. During the Delegation's visit to Michigan in October 2018, the State of Michigan and the UK signed an MOU in April 2018 to collaborate more closely in areas of CAV skills, academic exchange, and business matchmaking. Partners in both regions can find common concerns about CAV deployment and work together to address these concerns.

During hot topics discussion, **Frank Perry**, **Principal Consultant and CAV Program Manager of WSP**, discussed the need for a CV system channel plan. First, RSU deployment requires cross-jurisdiction coordination; second, if all RSUs along a corridor use the same service channel (SCH), only one vehicle can communicate (with a back office service) in the corridor at a time. However, if each RSU used a different Service Channel, then multiple vehicles could communicate with a back office service simultaneously. That's why the SCH needs to be carefully selected for each RSU.

Katie McLaughlin, Associate Consultant of WSP, introduced recently released Federal Automated Vehicles Policy 3.0. The document advances "USDOT's commitment to supporting the safe, reliable, efficient, and cost-effective integration of automation into the broader multimodal surface transportation system." The six automation principles are: 1) Prioritize safety; 2) Remain technology neutral; 3) Modernize regulations; 4) Encourage a consistent regulatory and operational environment; 5) Prepare proactively for automation; and 6) Protect and enhance the freedoms enjoyed by Americans. According to Katie, AV 3.0 is more comprehensive than AV 2.0. It reaffirms USDOT's reliance on a self-certification approach as the way to balance and promote safety and innovation. Finally, it places value on dialogue among stakeholder and the inclusion of USDOT, various stakeholders, and the industries.

Collin Castle, ITS Program Manager of Michigan Department of Transportation, provided an update on MDOT CAV activities. Collin first introduced the 2017 Connected and Automated Vehicle Program Strategic Plan, followed by a description of MDOT CAV deployments, which include four areas of V2I application concept of operations (red light violation warning, work zone management, road weather management, and pavement condition) and several key mobility deployment projects (e.g., truck platooning, CV enabled signals, connected work zone, and lane closures and restrictions replacement).

Collin finally introduced Michigan Council on Future Mobility annual report and activities related to vehicle code review and law journal announcement in the State.

Finally, Amanda Roraff, PlanetM Operations Manager of Michigan Economic Development Corporation (MEDC), presented "How Public-Private Partnerships (PPPs) Are Driving Mobility Pilots in Michigan." PlanetM was created in Spring 2016 to showcase mobility efforts and assets in Michigan. Asset coordination, company connections, and technology activations are the three key areas PlanetM is focusing on. Under technology activations, mobility startups have access to \$1.3 million in funding through the PlanetM Startup Grants. The two-part program includes a PlanetM Pilot Grant and a PlanetM Testing Grant. City Pilots are beginning in Grand Rapids, Ann Arbor, and Detroit. At the end of her presentation, Amanda talked about Project Kinetic Operating Platform, which is to support the deployment of six pilots by connecting concept owners to resources, capital, talent, partners, assets and opportunities that move each concept from pilot to scale.

The meeting adjourned at 12:00 pm.

MDOT maintains a webpage dedicated to its work related to CAV technologies (http://www.michigan.gov/mdot/0,1607,7-151-9621 11041 38217---,00.html). The page includes documents, presentations, and other materials that may be of interest to CAV stakeholders. Meeting packets containing materials (agenda, meeting notes, attendance, and presentation slides) from past Michigan Connected and Automated Vehicle Working Group meetings are also available on this page.

Michigan Connected and Automated Vehicle Working Group

Presentations



Michigan Connected and Automated Vehicle Working Group

Zahra Bahrani Fard, Transportation Systems Analyst, CAR

October 25, 2018

Southeast Michigan Council of Governments

Detroit, MI

Meeting Agenda

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Introductions and Update

Eric Paul Dennis, Senior Transportation Systems Analyst, TSA Center for Automotive Research

SEMCOG Welcome Address

Kathleen Lomako, Executive Director, SEMCOG

Creation of a Cyber Security Course for Automotive Technicians

Nelson Kelly Ph.D., Assistant Director, Center for Advanced Automotive Technology, Macomb Community College Securing V2X Communications – Can You Spell SCMS?

Mark Peters, Director Automotive Business Development, OnBoard Security

Comparison Between DSRC and C-V2X from a Vehicle and Infrastructure Perspective

Comparison Between DSRC and C-V2X from a Vehicle and Infrastructure Perspective

Hot Topics Discussion

Frank Perry, Principal Consultant, CAV Program Manager, WSP

Katie McLaughlin, Associate Consultant, WSP

10:50 AM Networking Break

11:10 AM Update o

Update on MDOT CAV Activities

Collin Castle, ITS Program Manager, Michigan Department of

Transportation

How PPPs Are Driving Mobility Pilots in Michigan

Amanda Roraff, PlanetM Operations Manager, Michigan

Economic Development Corporation

12:00 PM

Meeting Adjourned

Working Group Mission

Cooperatively pursue projects and other activities that are best accomplished through partnerships between multiple agencies, companies, universities, and other organizations and that ultimately advance Michigan's leadership position in connected and automated vehicle research, deployment, and operations.

Goals

- Benefit our state and our industry (automotive and more)
- Enhance safety and mobility in Michigan and beyond

Upcoming CAV Events

- INTEGR8: THE INDUSTRY 4.0 CONFERENCE November 14, 2018 | Automation Alley, Troy, MI
- Autonomous Vehicle Technology Expo 2018
 October 23-25, 2018 | The suburban Collection Showplace, Novi, MI
- Future of the Car Summit USA 2018
 November 8, 2018 | The Westin Book Cadillac, Detroit, MI
- Tech.AD Detroit
 November 14-16, 2018 | The Henry, Detroit, MI
- 2019 North American International Auto Show January 14-27, 2019 | Cobo Center, Detroit, MI
- Auto Mobiliti-D
 January 14-17, 2019 | Cobo Center, Detroit, MI
- Transportation Research Board Annual Meeting
 January 13-17, 2019 | Walter E Washington Convention Center, Washington, DC
- SAE Government and Industry

 April 3-5, 2019 | Walter E Washington Convention Center, Washington, DC

Thank you to our hosts!





Creation of a Cybersecurity Course for Automotive Technicians

October 25, 2018

Center for Automotive Research

Michigan Connected and Automated Vehicle Working Group

Nelson Kelly
Assistant Director, Energy and Automotive Technology
Center for Advanced Automotive Technology
Macomb Community College
14500 East 12 Mile Road
Warren, MI 48088-3896









Nelson Kelly
Assistant Director for Energy and Automotive Technology
Center for Advanced Automotive Technology (CAAT)
Macomb Community College

B. S. Chemistry
Ph.D. Physical Chemistry
Research Scientist
Macomb Community College
CAAT

Miami University (Ohio)
Pennsylvania State University
General Motors R&D Center
Adjunct Instructor
Assistant Director, Energy and Automotive
Technology

My background includes conducting research on the chemistry of photochemical smog formation, vehicle emissions, foundry emissions, airbag emissions, hydrogen production and storage, renewable hydrogen production, and battery charging using solar energy. I have published approximately 60 technical papers, have 17 patents, and recently wrote a book chapter on electrolytic hydrogen.

The Center for Advanced Automotive Technology (CAAT)

- Located at Macomb Community College, South Campus in Warren, MI
- Mission
 - Develop and disseminate advanced automotive technology curricula using seed funding
 - Connected, automated, intelligent vehicles
 - Light-weight materials for vehicles
 - Electric and hybrid vehicles and alternative fuels
 - Provide outreach activities to middle and high school students (STEAM)



Vehicles are Becoming Computer Controlled Electromechanical Devices

- Automotive technicians need to learn additional skills in addition to mechanical skills
 - Electronic
 - Computer
 - Experimental testing
- Service technicians will work on increasingly complicated advanced driver assistance systems (ADAS) leading up to autonomous vehicles
- A new type of technician is needed to assist engineers in developing and testing new systems
 - Vehicle Development Technician
 - Address engineer shortage

Vehicle Development Technician (VDT)

- 2-year Associate Degree in Automotive Technology
- Will work with engineers at an OEM or supplier
- Will work on test and prototype systems no service manual
- Needs to learn additional skills in addition to mechanical skills
 - Electronic
 - Computer
 - Experimental testing
- Began Fall 2018 at Macomb Community College

Vehicle Development Technician Degree Combines Automotive Technology, Engineering Technology, and Information Technology Courses

Automotive Systems	Course	Credits
Introduction	AUTO 1000 Automotive Systems	3
Transmissions	(drop)	
Engines	AUTO 1200 Automotive Engines	3
Brakes	AUTO 1100 Automotive Brake Systems	3
Chassis	AUTO 1130 Automotive Steering and Suspension	3
Electrical-Electronics	AUTO 1040 Automotive Electrical I AUTO 1050 Automotive Electrical II	3 3
Other	AUTO 2000 Connected, Automated, Intelligent Vehicles (NEW COURSE)	3
Engineering Technology/Electronics		
Fundamentals	TMTH 1150 RCL Analysis ELEC 1161 Electronic Technology 1 ELEC 1171 Electronic Technology 2	4 3 3
Applications	ELEC 1211 Digital Electronics Basics ELEC 2150 LabVIEW Basics 1	3
Software	ITCS 1140 Intro. to Program Design & Development	4
Networking	ITNT 1500 Principles of Networking	4
Testing	ELEC 2310 Vehicle Experimental Testing (NEW COURSE)	4
Product Design	PRDE 1250 Basic Blueprint Reading	2
Science Elective	PHYS 1180 Physics (recommended)	4

CAAT Developed CAV Curriculum

- Three free courses are available in the CAAT website Resource Library
- Springfield Technical Community College
 - Automated, Connected, and Intelligent Vehicles
 - Comprehensive syllabus, 15 lectures, quizzes, projects for 16 week, 3-credit course
 - Basis of new course, AUTO 2000 at Macomb Community College
- Jackson State (2 courses)
 - Sensors used in connected and automated vehicles
 - Navigation techniques used in connected and automated vehicles

http://autocaat.org/Educators/Seed_Funding/Funded_Programs/

How Has CAAT Used the Connected, and Intelligent Vehicles Materials?

- Created AUTO 2000, 3-credit, 16-week
 - course will cover the technologies and systems that will enable automated vehicles
 - Operation, maintenance and repair of safety and selfdriving systems
- Will be taught for the first time at Macomb
 Community College as part of the <u>new</u> Automotive
 Technology-Vehicle Development Technician degree program

CAAT has Identified the Need for a Automotive Cybersecurity Course

- Use CAAT seed funding model
 - Proposal, review, revision, contract with deliverables and dates, approval of resources, payment, free posting of materials in CAAT Resource Library)
- Step 1: CAAT prepares course outline
 - Research, webinars, meetings, books, journal articles
 - identify and solicit input from experts
- Step 2: Issue RFP on CAAT web site with instructions
 - this is done see slide 12 for a link
- Step 3: Choose best proposal, solicit expert's comments
- Step 4:Revise proposal and issue a contract
 - Deliverables and dates
- Step 5: Review course materials, approve, and post for free use on CAAT web site

Cybersecurity Course Content

(first pass)

- Automotive electronics, ECUs, and CAN
 - Software and firmware
- Attacking (hacking) vehicles and connected/automated vehicles
 - History, Miller and Valesek Jeep hack, cybersecurity awareness
 - Attack vectors; types of threats and attacks
- SAE and ISO standards
 - J3061, ISO 21434
 - Safety <u>and</u> security from start to finish
- Textbooks and reports
 - Cybersecurity for Commercial Vehicles (2019), The Car Hackers Handbook (2016)
 - SAE Journal, Transportation Cybersecurity and Privacy (2018)
 - SAE , Cybersecurity for Commercial Vehicles, Gloria D'Anna (2019)
- Protecting vehicles from attacks
 - Penetration testing
 - SCMS

Review Existing or Currently Planned Automotive Cybersecurity Courses

- SAE
 - Short courses, J 3061, etc.
 - SAE CyberAuto Challenge (5-day hands-on)
- MAGMA (short course from SAE)
 - "Cybersecurity: An Introduction for the Automotive Sector"
- Walsh College
 - B.S. in Information Technology with a concentration in Automotive Cybersecurity
- Square One (short courses and 12-week program)
 - "Masters of Mobility"
- Pinckney Cyber Training Institute (some automotive)
 - Hub on Michigan Cyber range

CAAT is Ready to Receive Proposals for an Automotive CyberSecurity Course

http://autocaat.org/Educators/Seed Funding/
 Apply for Seed Funding/

Read the cover letter and follow the directions

 Download the proposal form and fill it out and email it to <u>kellyn@macomb.edu</u>

How can the CAR CAV Working Group Help?

- Provide input on the course outline
 - What automotive cybersecurity foundational skills/knowledge would you like to see in a new hire
- Review the proposals CAAT receives
 - 5 to 10 pages
 - What's missing, what is unnecessary?
- Review course materials (all or just some)

Contact Information

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www.autocaat.org

Backup Slides

CAAT Seed Funding is a Mechanism for Developing New Educational Materials In Emerging Automotive Technologies

- Unique process developed by CAAT
- Funding available for educational institutions to develop materials for automotive technician education in advanced automotive technologies:
 - Latest materials are complete courses (targeted seed funding)
 - ✓ Comprehensive syllabus with learning outcomes and objectives
 - ✓ Lectures
 - ✓ Other materials, homework, quizzes, projects
 - 17 seed funding projects completed
 - ✓ Hybrid and electric vehicles Lightweighting
 - ✓ Connected and automated vehicles
 - ✓ Vehicle experimental testing
 - **✓** STEM

CAAT's 17 Seed Funding Partners and their Contributions to New Course Materials

	Institution	Hybrid or Electric Vehicles	Light Weighting	Connected Automated Vehicles	Completion Date
1	Lawrence Technological University	Х			2011
2	Lewis and Clark CC	X			2011
3	Grand Rapids CC	Х			2012
4	Lansing CC	Х			2012
5	Grand Valley State University & Muskegon Community College	Х			2013
6	Ivy Tech CC	Х			2014
7	Kent Intermediate School District	STEM			2014
8	Utica Community Schools	STEM			2014
9	Wayne State University	Х			2015
10	University of Alabama at Birmingham	Х			2015
11	Jackson State University			Х	2016
12	Kettering University		Х		2016
13	Roane State Community College		Х		2017
14	Kettering University		Х		2016
15	Springfield Technical Community College			Х	2017
16	Kettering University		Х		2016
17	University of Alabama Birmingham			Exp. Test	2017 ¹⁷

Let's Look at an Example of the Results of a Seed Funded Course

- Connected, Automated, and Intelligent Vehicles
- Created by Prof. Gary Mullett of Springfield Technical Community College
 - CAAT paid \$20,000
- The course materials are available for free to anyone at the CAAT web site
 - Comprehensive syllabus with learning outcomes, course outline, and course map
 - 15 PowerPoint lectures
 - Quizzes and Projects

http://autocaat.org/webforms/ResourceDetail.aspx?id=4551

Auto 2000, Course Outcomes and Objectives

• Outcome 1: Student will be able to explain the benefits of computer controlled electromechanical systems on vehicles

Objectives:

- 1. Identify which automotive systems have been replaced by electronic control systems
- 2. Apply the fundamental theory of operation of electronic control systems
- 3. Apply the basics of how automotive electronic control units (ECUs) function in conjunction with the vehicle data bus networks and sensors
- 4. Identify the various types of advanced driver assistance systems (ADAS)
- 5. Apply and their application to collision avoidance and autonomous vehicles
- 6. Identify the advantages of fully automated vehicles with regard to impaired driver technology
- Outcome 2: Student will be able to explain the six different levels of automation

Objectives:

- 1. Analyze modern display/cluster technology in semi-automated vehicles
- 2. Compare the responsibility for the vehicle action: human driver versus the cyber-physical control systems
- 3. Analyze differences in the human-machine interface in semi-automated vehicles
- Outcome 3: Student will compare the types of sensor technology needed to implement remote sensing of objects

Objectives:

- 1. Analyze the operation of radar systems and data
- 2. Analyze the operation of camera systems and data
- 3. Analyze the operation of Lidar systems
- 4. Analyze the operation of ultra-sonic sensors
- 5. Identify the strengths and weaknesses of each of the above systems

Auto 2000, Course Outcomes and Objectives, continued

• Outcome 4: Student will be able to explain the concept of a connected vehicle

Objectives:

- 1. Apply the basic concepts of wireless communications and wireless data networks
- 1. Interpret the role of various organizations in the development and evolution of vehicle to vehicle and vehicle to infrastructure standards
- 2. Give real-world examples of data networking and its roll in advanced driver assistance systems (ADAS) and future autonomous vehicles
- 3. Identify protocols, and IP addressing, and on-board vehicle networks
- Outcome 5: Student will analyze the concept and advantages of sensor data fusion

Objectives:

- 1. Identify the reasons for redundancy in sensors
- 2. Interpret the importance of signal to noise ratio
- 3. Use sensor inputs to control system response
- 4. Analyze new skill sets needed by technicians to work on intelligent vehicles

Course syllabus:

http://ecatalog.macomb.edu/content.php?catoid=33&navoid=3127

Automotive Technology-Vehicle Development Technician Associate Degree

0	O Title	Semester	Semester			Credits
Course and Sequence	Course Title	1	2	3	4	0
AUTO-1000	Automotive Systems	3	0			3
AUTO-1040	Automotive Electrical I		3	0		3
AUTO-1050	Automotive Electrical II			3		3
AUTO-1100	Automotive Brake Systems			3		3
AUTO-1130	Automotive Steering and Suspension		0	3		3
AUTO-1200	Automotive Engines		3			3
TMTH-1150	RCL Analysis	4				4
ELEC-1161	Electronic Technology 1	3				3
ELEC-1171	Electronic Technology 2	3	0			3
ELEC-1211	Digital Electronics Basics		3			3
ELEC-2150	LabVIEW Basics 1			3		3
ITCS-1140	Intro. to Programing Design & Development		4			4
ITNT-1500	Principles of Networking			4		4
PRDE-1250	Basic Blueprint Reading				2	2
ELEC-2310 NEW	Vehicle Experimental Testing				4	4
AUTO-2000 NEW	Connected, Automated & Intelligent Vehicles				3	3
Core Hours Total		13	13	16	9	51
Gen Ed, Group I	ENGL 1180 (4) or ENGL 1210 (3)	3				3
Gen Ed, Group II	PHYS 1180 (recommended)		4			4
Gen Ed, Group III	ECON 1160 (recommended)				3	3
Gen Ed, Group IV	ENGL 2410 (recommended)				3	3
Gen Ed, elective	Gen Ed elective of 2 or more credits				2	2
General Ed Total		3	4	0	8	15
Grand Total		16	17	16	17	66

Michigan Connected and Automated Vehicle Working Group – October 25, 2018

Securing V2X Communications - Can You Spell SCMS?



Secure V2X Communications Challenge

Authenticity

Need to validate that messages are from trusted devices

 Prevent attackers from creating fake messages to change traffic patterns or create a road hazard VS.

Privacy

Can't make it easy to track personal vehicles

- Each BSM contains exact position information
- Data is sent unencrypted to enable fast response time

- Digital signatures can prove that a message is "authentic" and unmodified but only if you know you can trust the sender
- How do you trust the sender if you can't know who the sender is?

Pseudonyms

- Give each vehicle a fake name or pseudonym
- If you trust the entity that issued the pseudonym, they you can trust the message

.... but you can track the vehicle, so

Give each vehicle a LOT of pseudonyms and switch identities frequently

....but how do these IDs get issued?

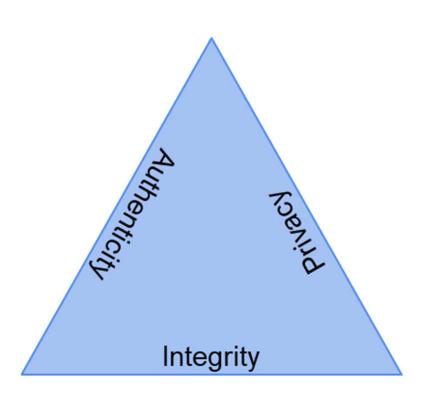
Crash Avoidance Metrics Partnership (CAMP)



- CAMP contracted by the US DOT
 - Design the Security Credential Management System (SCMS)
 - Develop a working prototype system
 - Support the US Connected Vehicle (CV) pilots in New York, Florida, and Wyoming

Security Credential Management System (SCMS)

- Crucial requirements that must be met are:
 - Ensure authenticity and integrity of messages
 - Minimize opportunity for tracking personal vehicles
- System also mandates:
 - Privacy for users: No PII can be collected
 - Prevent tracking by insiders & outsiders
 - Assume errors will happen and hackers will attack the system
 - Detect and remove misbehaving systems
 - Minimize over the air messaging bandwidth
- Tricky Result:
 - Create a high volume of anonymous short lived identities
 - and still be able to revoke these identities when needed



Design for Security and Privacy

Security

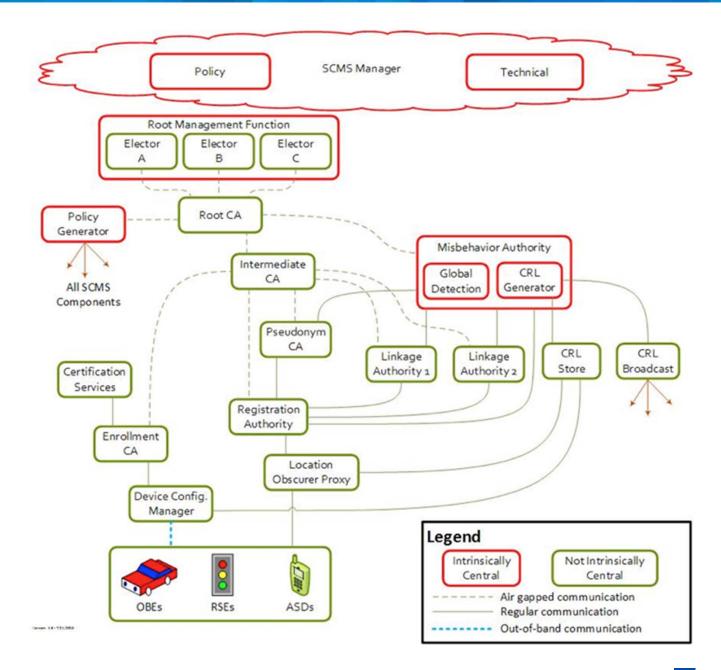
- Every message is digitally signed (but not encrypted)
- Linkage values allow for "misbehavior detection" and revocation

Privacy

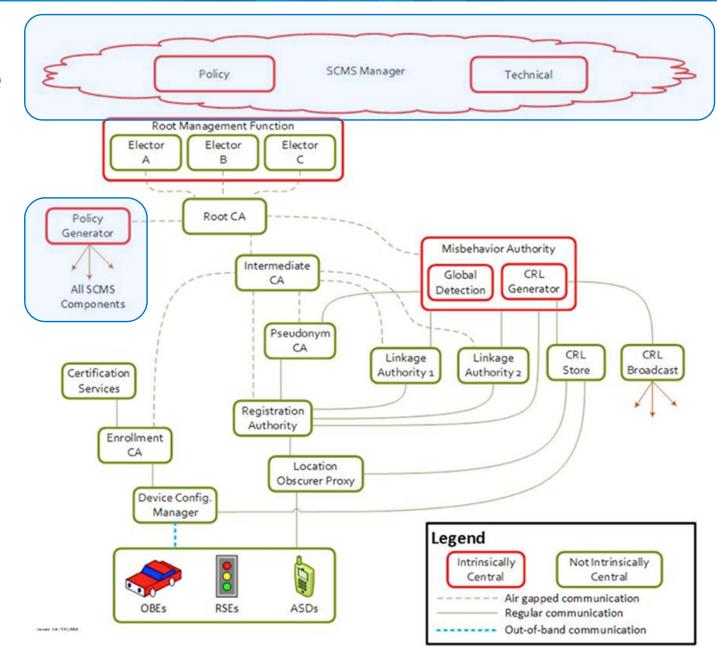
- No unique information about the car or the owner
- Certificate changes every 5 minutes
- Cycle through 20 certificates every week

20 new certificates per week per car with ~250M cars (US) = 260B certificates per year

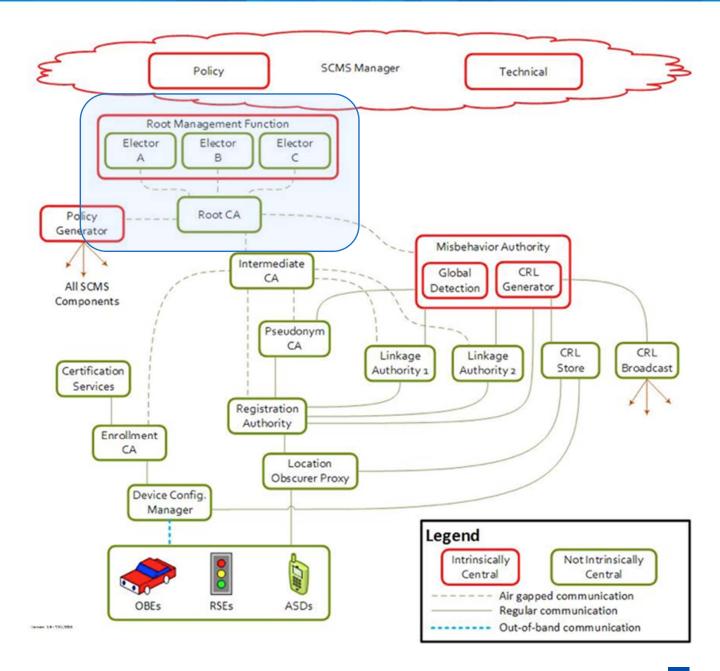
- The Security Credential Management System (SCMS) is a CA Hierarchy
- Each element of the system has special rights and functions
- "Intrinsically Central" components are operated by a single authority
- Non-Central components can have multiple instances, each run by a different organization



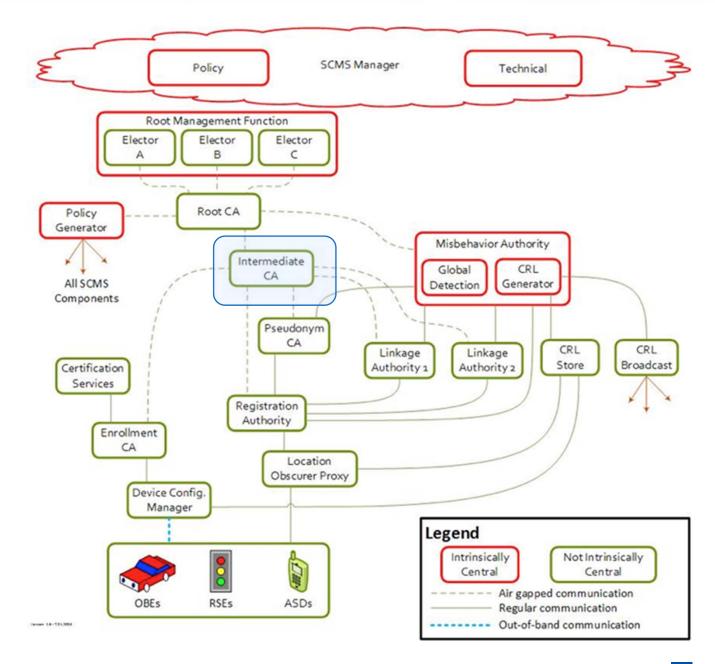
- Policy & Technical Management
 Manages overall system
- Root Management
 Establishes the system-wide "root of trust"
- Local Management
 Issues local certificates
- Enrollment
 Activates new devices in the system
- Certificate Batch Management
 Delivers batches of pseudonym certificates
- Misbehavior Detection
 Identifies bad actors, creates and distributes a
 Certificate Revocation List



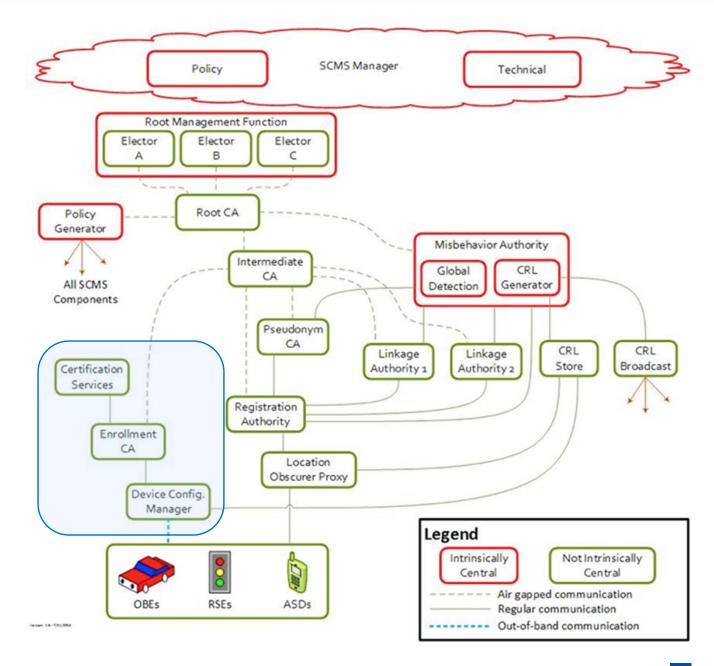
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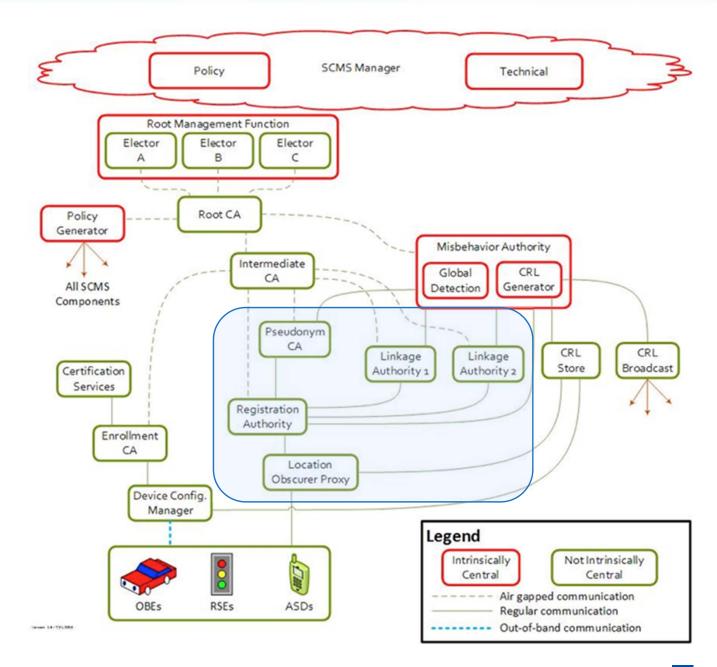
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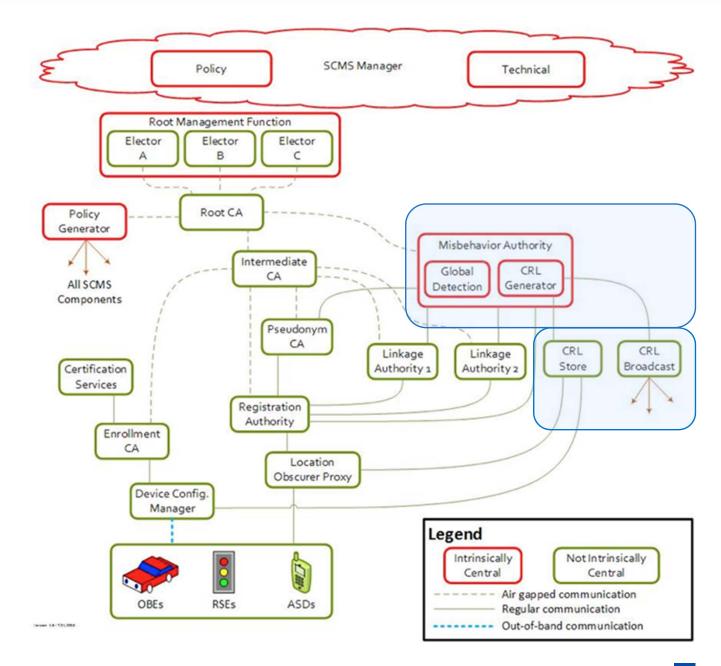
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Specific Certificate Types in the V2X System

Enrollment Certificate

- Issued to an vehicle in manufacturing, long validity period (~6 years)
- Used as "password" to access the SCMS
- Does not contain any identifiable information about the vehicle or owner
- A vehicle has only one valid enrollment certificate at a time

Pseudonym Certificate

- Generated in batches, downloaded by the vehicle on the road
- Used to sign BSMs and other V2V or V2I messages
- A vehicle typically has 20 valid pseudonym certs at one time, valid for 1 week

Identity Certificate

- Issued to a vehicle through a registration process, may have a long life
- Used for special applications emergency, commercial, military, etc.
- May contain specific identification information

Application Certificate

- Issued to roadside equipment to enable V2I applications
- Typically has a short life (1 day or 1 week), replaced when needed

SCMS Implementation Plans

- There were 3 distinct instances of the SCMS planned:
 - Development (DEV) intended only for ongoing development and testing
 - Proof of Concept (POC) intended for PoC pilot use only
 - Production (PROD) supports production vehicles

 The DOT had a goal of migrating CV Pilot devices and vehicles over to the PROD environment after the end of the pilot phase

Current Status of the SCMS

- Development (DEV)
 - Implemented, supported PlugFest in Oct-2017, May-2018
- Proof of Concept (POC)
 - Implemented, abandoned due to limited expected lifetime and projects
- Commercial
 - GreenHills implementation available to support all projects
 - Additional entrants, Blackberry, ETAS, Penta Security. Common Root under discussion, Electors for multi Root support is in specification phase.
- Production (PROD)
 - Under study
 - Booz Allen has contract to determine next steps for Government role.

Information

Public documentation on SCMS interface (release 1.2.2) is available online:

https://wiki.campllc.org/display/SCP/SCMS+CV+Pilots+Documentation

Any questions – contact me anytime

Mark Peters

OnBoard Security

mpeters@onboardsecurity.com (248) 318-0710



COMPARISON BETWEEN DSRC AND C-V2X FROM A VEHICLE AND INFRASTRUCTURE PERSPECTIVE

Michigan Connected and Automated Vehicle
Working Group 10/25/2018

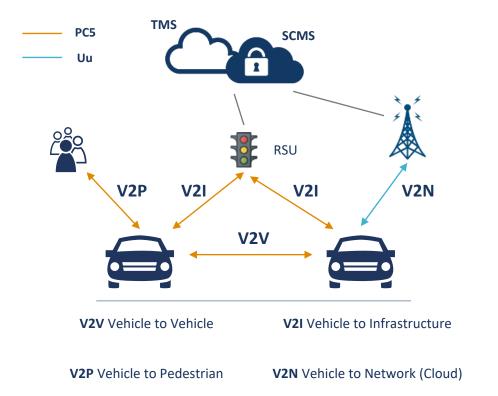
P3 North America

Colin Goldsmith





Introduction to the Concept of V2x Communication for Automotive - Use Cases and Aspired Benefits



Use Cases

Do Not Pass Warning	Left Turn Assist	Platooning
Blind Curve/ Local Hazard Warning	Signal Phase & Timing	Emergency Vehicle Warning
Vulnerable Road User Warning	Intersection Movement Assist	

Target Picture



Reduction of Accidents w/ Deaths & Injuries Through Augmentation of Vehicle Sensors & Safety Systems



Increase of Traffic Flow In Cities & Highways Through Intelligent Speed and Vehicle Routing Control

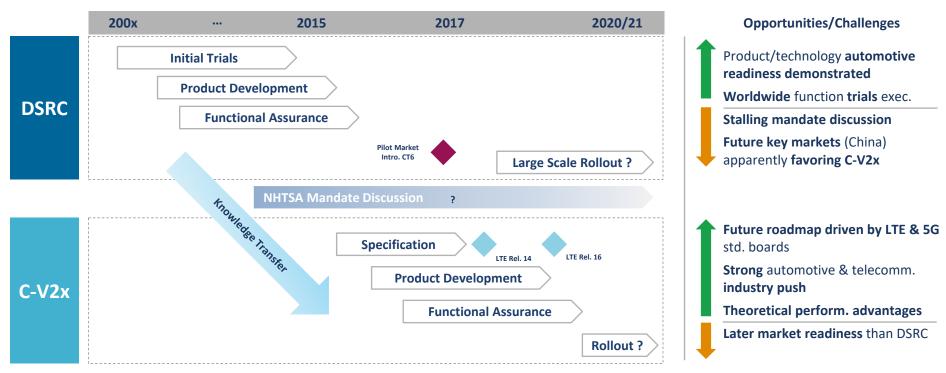


Real-Time Situational Awareness for Vehicles Beyond Line of Sight (Smart Adaption and Warnings)





DSRC Based V2X Solutions Are Suddenly Receiving Significant Scrutiny Not Only by a Stalling Mandate Discussion but Also by the Competitive Technology & Market Threat Posed by C-V2X



Illustrative





Automotive OEMs and Other Major Industry Players Have to Review Technology as Well as Market & Product Realization Factors to Evaluate and Define a Comprehensive V2X Strategy

DSRC



C-V2x



Costs of Implementation

OBU, System & Lifecycle (Security)

Real-world Performance

Range, Quality of Transfer, Max. Vehicles per Area

Technology Longevity

Roadmap for Technology Improvements w/o Disruption

Technology Availability/ Versatility

Supplier Capabilities, Secondary Use Cases

Illustrative



Vehicle



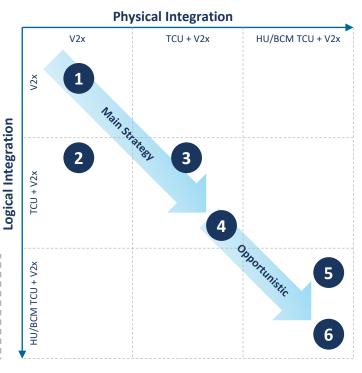


Automotive OEMs Are Able to Realize Even Deeper Levels of HW Consolidation, but It Is Important to Analyze the Benefit & Drawbacks of Each Product Scenario in Detail Regarding Overall Impact



- 2 V2x Add-on Module for TCU
- TCU with Integrated V2x
 Modem
- TCU with Integrated LTE-C-V2x Modem
- Head-unit/BCM with
 Attached LTE/V2x Modem
- Fully Integrated HU/BCM with LTE/V2x Functions

Not investigated



BCM: Body Control Module TCU: Telematics Control Unit HU: Infotainment Head-Unit

Driving Factors

Supplier Engagement Strategy & Options

In-House System Competencies

Emerging Vehicle EE Platform Requirements

Future EE Communication Use Cases

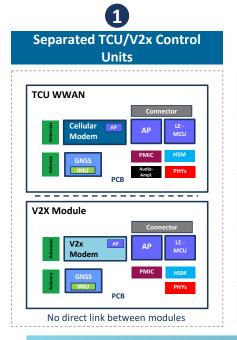
Key Questions

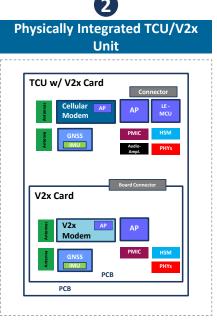
- What are direct/ indirect benefits of phys. & logical integration?
- How does it change future product requirements?
- How does it affect the product development processes?
- How does it enable or limit world-wide regulation & market needs compliance?

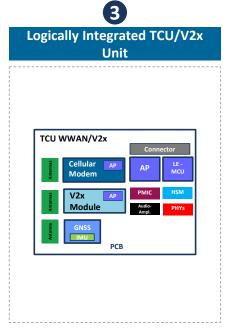


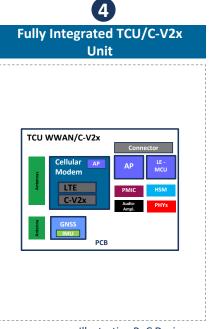


The Opportunities for Future V2x Product Design Are Directly Linked to the Type of Selected Base Communication Technologies. Currently, C-V2x Is Posed to Enable Deeper Logical + Physical Integration









DSRC / C-V2x Based Integration Options

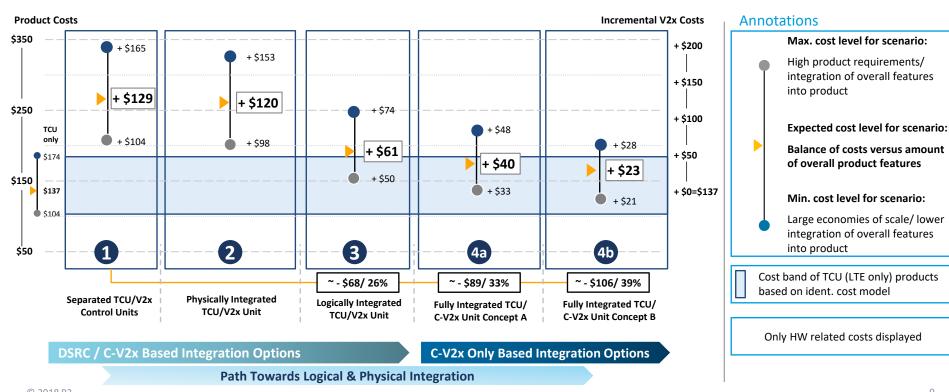
Illustrative PoC Designs

C-V2x Only Based Integration Options





The costs for the V2x introduction into automotive vehicles differs vastly based on the implementation strategy and the selection of V2x base technology DSRC/C-V2x







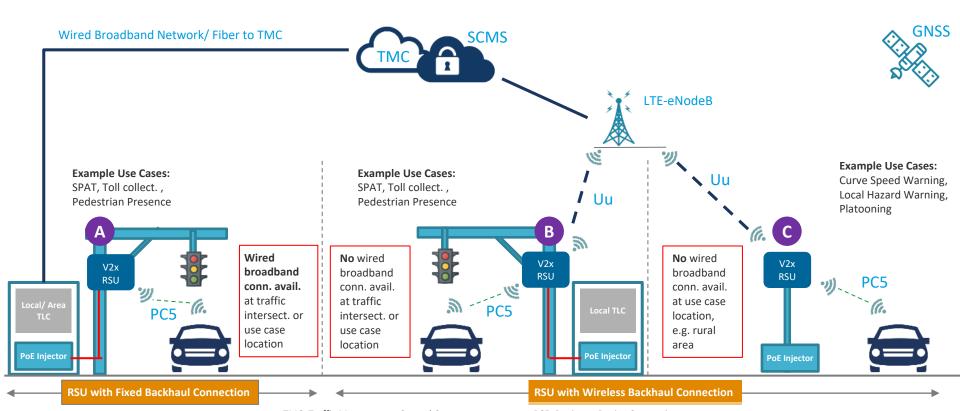


Infrastructure





Road-Side Unit Types Introduction



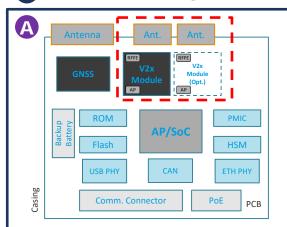


Focus Area of Config. Change



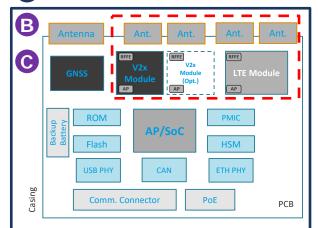
RSU Product Scenarios Investigated

1 Baseline RSU Design



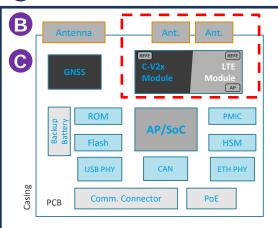
- Design & component selection similar to existing to DSRC based RSUs, one or tworadio (optional, not investigated) config
- Backhaul to TMC & SCMS conn. realized through TLC
- V2x function enabled through DSRC or C-V2x modem

2 Extended RSU Design



- Similar product config. as scenario 1
- Backhaul conn. for V2x and TLC functions realized through LTE module (with active subscription)
- V2x function enabled through DSRC or C-V2x modem

3 Fully Integrated RSU Design

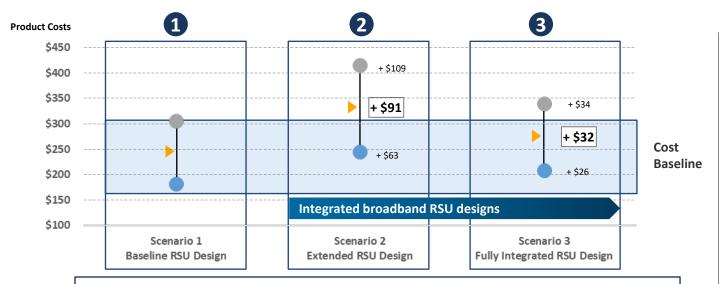


- LTE-C-V2x combination module (Rel. 14 compliant) instead of dedicated modems
- Otherwise same configuration as scenario 1/2





Scenario Specific Cost Comparison





Compared to RSU product independent costs factors (such as installations) HW cost differences due to technology DSRC vs. C-V2x are less prominent and critical

Integration of cellular network access module into base system is a main cost driver, but can be optimized by using C-V2x/LTE combo modules

- Difference for C-V2x/DSRC based Scenario 1 configuration not displayed, actual cost differences in lower single digit area
- Shared antenna sets for Scenario 3 for LTE and C-V2x functions, coordinated by modem host and RFFE

Annotations

Max. cost level for scenario:

High product requirements/ integration of overall features into product

Expected cost level for scenario:

Balance of costs versus amount of overall product features

Min. cost level for scenario:

Large economies of scale/ lower integration of overall features into product



Cost band of baseline V2x RSU configuration

Only HW related costs displayed





Traffic Systems Worldwide Have Been Created over the Last Decades and Centuries with Focus on Local Needs and Boundaries Rather Than Intelligent Planning and Coordination

Highways





Metro

Key Issues with Traffic Systems in the USA (but also Worldwide)

- Heavily parcellated across different authorities (city, county, state, federal)
- Current budgets only available for incremental upgrades of traffic systems/technology
- Significant amount of traffic control systems in place without central management of configurations, requiring integration for demand-depending traffic management
- Low amount of wired broadband network available at potential RSU locations (high costs for provisioning of wired access, e.g. Fiber)

Rural



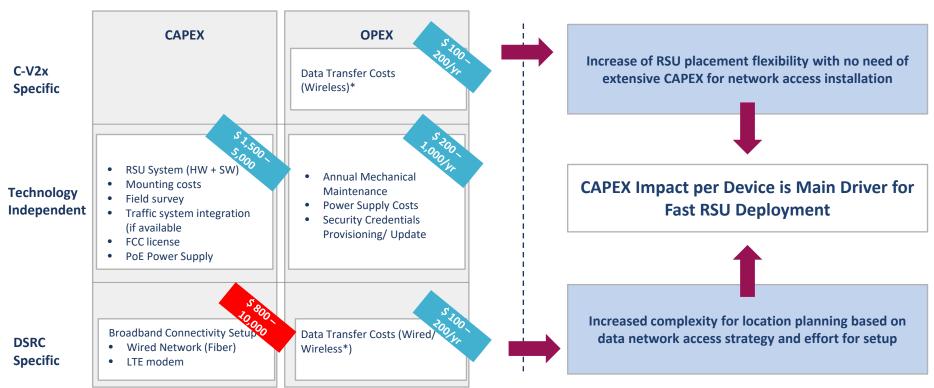


City





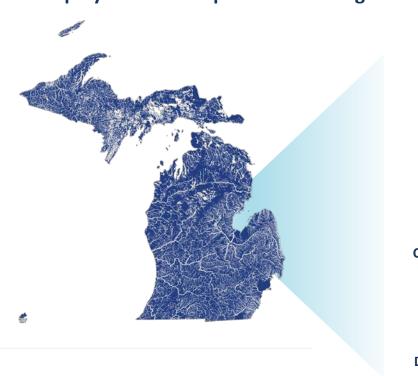
The Impact of Technology Selection Can Be Tremendously If We Are Looking Outside of the Product System Boundaries



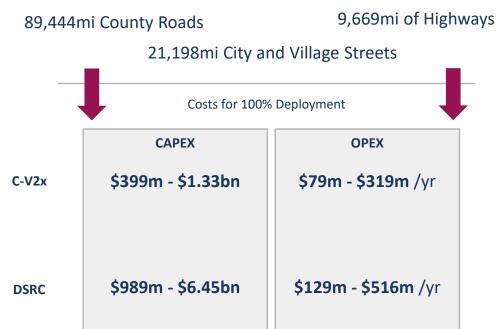




RSU Deployment in Perspective of Michigan



120,256mi Paved Roadways



Conclusion

1

V2x Vehicle Deployment Paving the Way

Vehicle deployment can be done independently from infrastructure setup, but key point will be selection of base technology by main OEMs or mandate. Conflicting OEM strategies pose the risk of costly technology exchange programs or incompatibilities in the long term

2

Smart Infrastructure Uncertain About Scale and Benefit

RSU deployments will happen very slowly and most likely will focus on key traffic situations, but a 100% coverage will be costly from a CAPEX and OPEX perspective. Backend based communication paths without need for V2x technologies are posing a direct threat

3

Challenged Monetization and Value Multiplicators of V2x for Major Stakeholders

Monetization Strategies & Business Models for road authorities/operators and automotive companies still have to be identified that enable a broad deployment of V2X. Use case benefits are still unknown and therefore a high risk present of missed expectations in the long-term

The need for a CV System Channel Plan



CV Channel Plan

CV Channel Plan

- Typical DSRC RSUs have 2 radios supporting 3 Channels
 - Radio 0: Continuous on Safety Channel 172
 - BSM, SPaT, and Map
 - Radio 1: Alternating between the Control Channel (CCH) 178 and a Service Channel (SCH)
 - CCH: WSA, TIM, SSM
 - SCH: IPv6, Certificates, Probe Data, Weather Data, SRM
- The SCH needs to be carefully selected based on how/where the RSUs are deployed.



CV Channel Plan

CV Channel Plan

- Why do we need to carefully select the SCH for each RSU?
 - Using the same SCH for all RSUs is easier for configuration and O&M in general; it's 1 less configuration item we need to think about
 - SAE recommends a SCH for specific messages



CV Channel Plan

CV Channel Plan

- In DSRC, only 1 device can transmit at a time
 - For broadcast messages (BSM, WSA, SPaT, etc.), this is not an issue
 - Messages are short and repeated
 - A single device only ties up a channel for a few milliseconds
 - For IP based messages, data is exchanged between devices
 - Session based
 - A single device can tie up a channel for several seconds

 If all RSUs along a corridor use the same SCH only 1 vehicle can communicate (with a back office service) in the corridor at a time

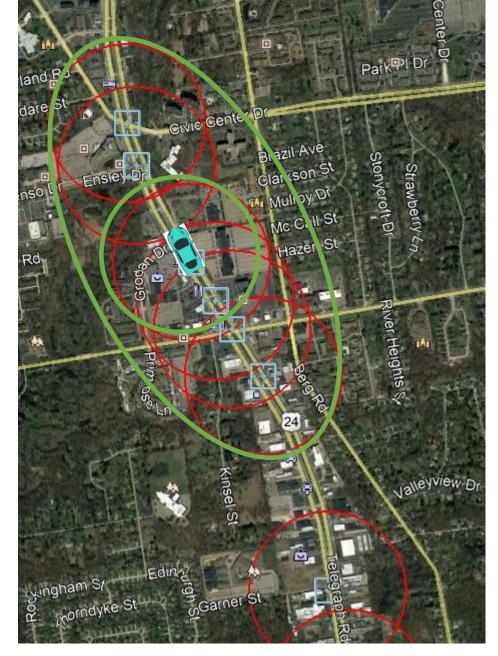


CV Channel Plan

All RSUs using the same SCH

A single vehicle downloading certs

 Prevents other vehicles from downloading certs, uploading Probe Data, or uploading Weather data





Each RSU uses a different SCH

If each RSU used a different Service Channel, then multiple vehicles could communicate with a back office service simultaneously

That's why the SCH needs to be carefully selected for each RSU





CV Channel Plan

Also

SCH 180 and 182 have a lower maximum transmit power than the other channels per FCC; 23 dBm compared to 33 dBm



Frank Perry,
Principal Consultant, WSP
frank.perry@wsp.com



Federal Automated Vehicles Policy 3.0

PREPARING FOR THE FUTURE OF TRANSPORTATION



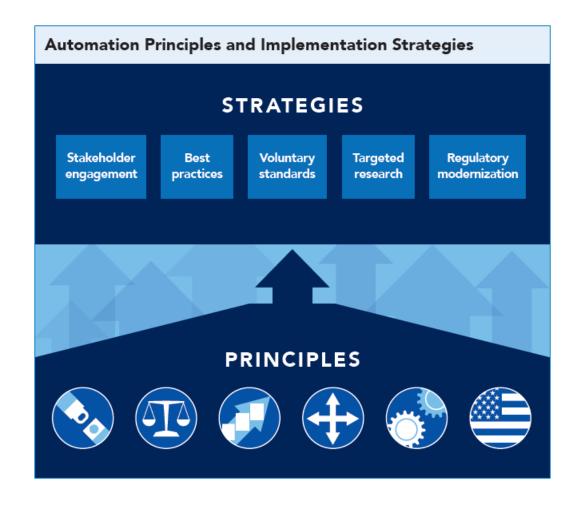


U.S. DOT Automation Principles

- 1. Prioritize safety
- 2. Remain technology neutral
- 3. Modernize regulations
- 4. Encourage a consistent regulatory and operational environment
- 5. Prepare proactively for automation
- 6. Protect and enhance the freedoms enjoyed by Americans



U.S. DOT Automation Principles and Implementation Strategies





General Observations

- More comprehensive than V 2.0
 - Incorporates key industry input
 - Provides a broader set of guidance for the industry
- Reaffirms USDOT's reliance on a self-certification approach as the way to balance and promote safety and innovation
- Places value on dialogue and inclusion, and frequently encourages all parties to use USDOT as a facilitator for dialogue among the various stakeholders and industries.



Notable Updates from Version 2.0

- New section on Cooperative Automation and Connectivity
 - Encourages industry stakeholders to continue developing technologies that leverage the 5.9 GHz spectrum for transportation safety benefits
 - Does not promote any particular technology over another
- Removes the former Automated Vehicle Proving Grounds designations.
 - USDOT no longer recognizes the designations of 10 "Automated Vehicle Proving Grounds" announced on January 19, 2017
- Publicizes efforts to develop a Work Zone Data Exchange
 - A specification for work zone data that infrastructure owners and operators can make available as open feeds for automated vehicles and others
- Introduces the Safety Risk Management Stages
 - Presents steps along the path to full commercial integration of AVs
 - Promotes the benefits of safe deployments/pilots while managing risk and providing clarity to the public



Notable Planned Federal Actions

- NHTSA to seek comment on proposed changes to FMVSS
- NHTSA to seek comment on a proposal to change procedures for FMVSS exemption petitions
- FMCSA to initiate an Advanced Notice of Proposed Rulemaking to better understand areas of responsibility between the federal and state governments for automated driving systemequipped commercial motor vehicles and commercial carriers
- FHWA to pursue an update to the 2009 MUTCD
- FTA to work with transit agencies to provide tailored technical assistance
- USDOT to partner with other federal cabinet agencies on a comprehensive analysis of:
 - Workforce impacts from AVs
 - Research toward improving the mobility of travelers with disabilities



Federal Automated Vehicles Policy 3.0

Discussion

PREPARING FOR THE FUTURE OF TRANSPORTATION







Michigan CAV Working Group

MDOT Update

COLLIN CASTLE, P.E.

Michigan Department of Transportation







MICHIGAN DEPARTMENT OF TRANSPORTATION

2017 Connected and Automated Vehicle Program Strategic Plan



PROGRAM GOALS



Goal 1: Serve as a national model to catalyze CAV deployment



Goal 4: Accelerate CAV benefits to users



Goal 2: Establish Foundational systems to support wide-scale CAV deployment



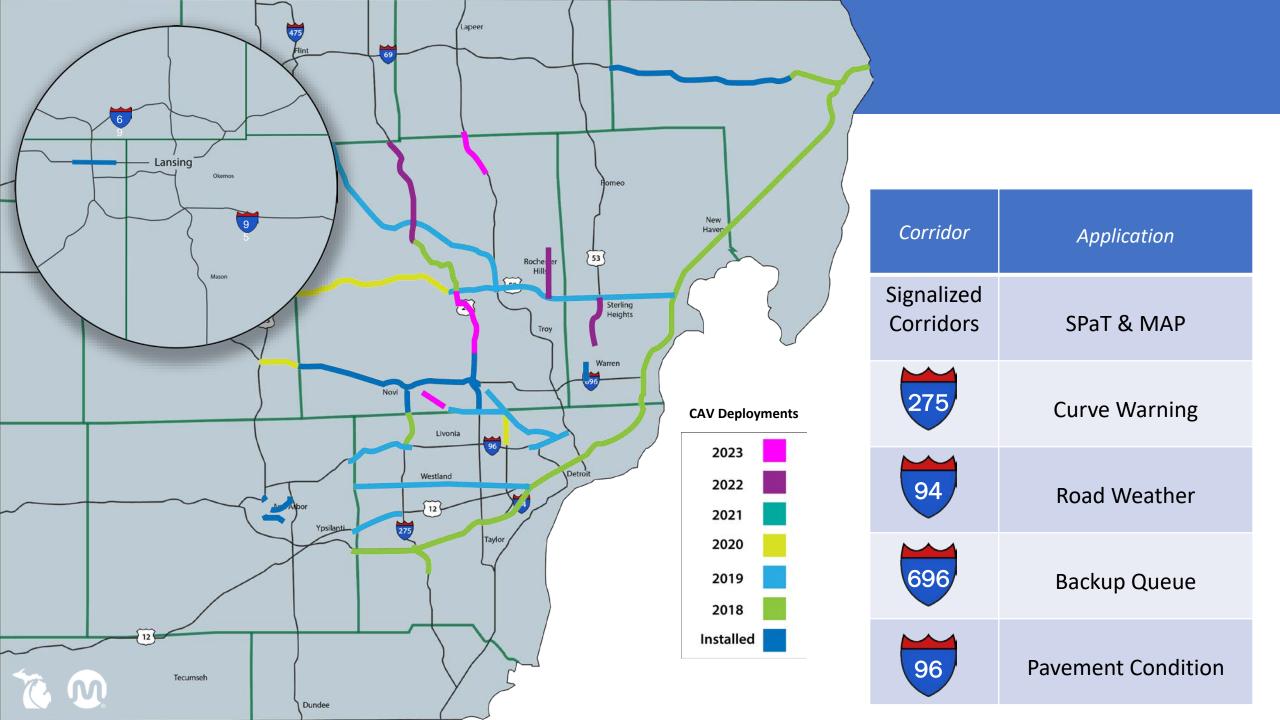
Goal 5: Exploit mutual benefit opportunities between CAV tech and other department business processes/objectives



Goal 3: Make Michigan the go-to state for CAV research and development



Goal 6: Use Michigan experience to lead dialogue on national standards and best practices

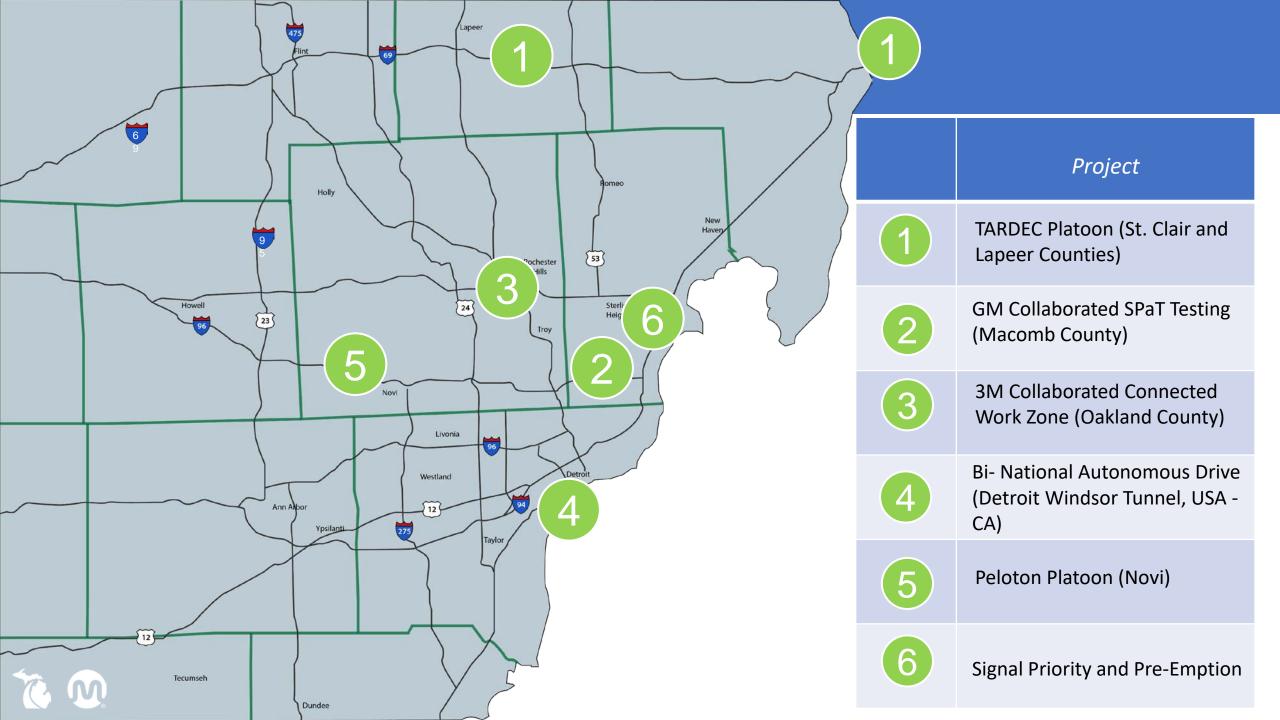


V21 Application Concept of Operations



Red Light Violation Warning Work Zone Warning/ Management Road Weather Management

Pavement Condition













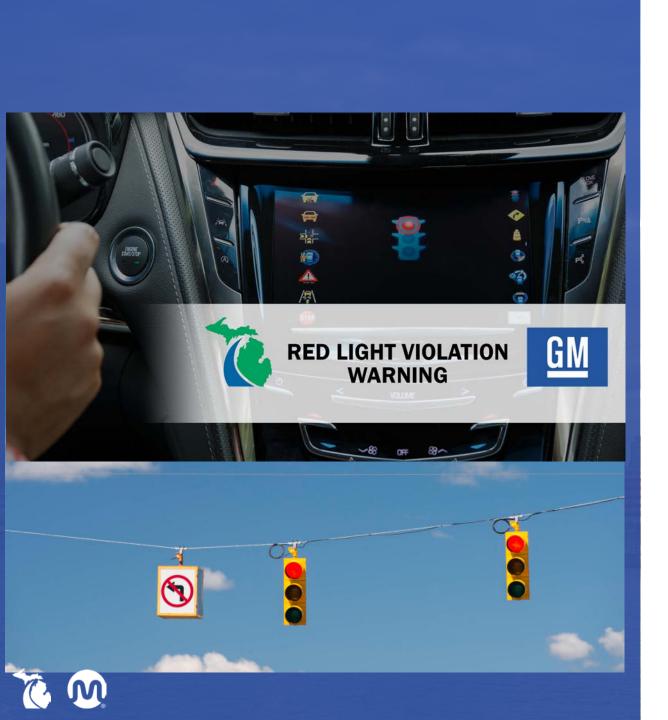


PUBLIC ACT NO. 332

OPEN FOR TRANSPORT

- I-69, Blue Water Bridge
- Platooning of military vehicles
- Supporting the military, large shipping, or logistics companies







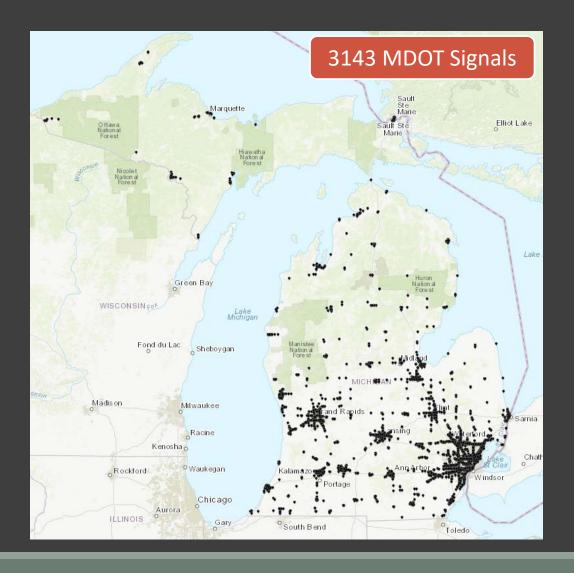
MDOT ITS SIGNALS CV INITIATIVE

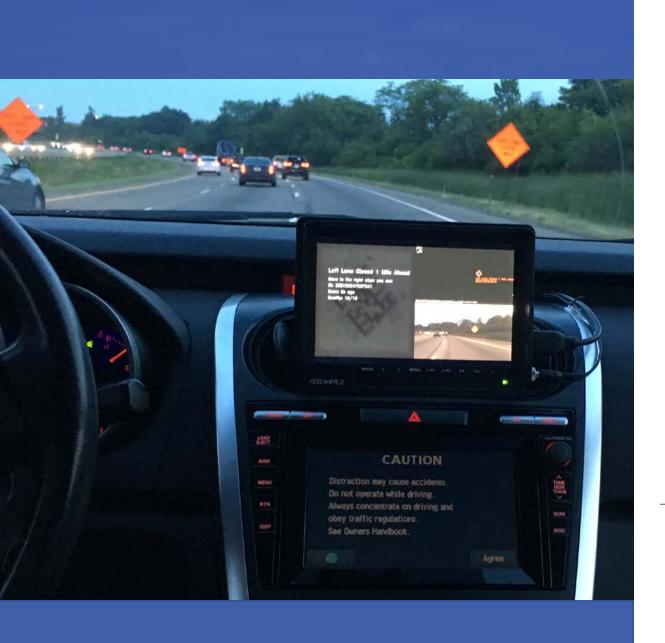
- CV Enabled Signals Policy
- Signal Controller Spec Update
- All new or upgraded traffic signals on the MDOT system will be CV-enabled going forward



MDOT Traffic Signal Inventory

Superior Region=79 North Region=134 59 Closed Loop Grand Region=378 **Systems** Bay Region=488 Southwest Region=274 University Region=483 Metro Region=1307 3143 Signals 510 on 1498 Maintained by Statewide **TACTICS Local Agency**







PHASE ONE

Nation's first connected work zone

PHASE TWO

Permanent deployment of technology

- Planet M provides an Open Invitation for Innovation
 - Collaboration with 3M
 - Inclusion of Local Agencies
 - All weather testing 24/7















SIGNAL PRIORITY

- Improving the mobility of transit and first responders
 - Real world testing in Macomb County
 - Debuted demonstration at the ITS America 2018 Conference

Lane Closures and Restrictions (LCAR) Replacement



- Improve work zone data collection
- Replace End of Life System
- Developed in Coordination with Mi Drive
- Developed in DUAP System
- Newly developed system to support:
 - Data Collection
 - Data Management
 - Data Distribution
 - Mi Drive Website
 - 3rd Party Traveler Info Providers
 - Connected Vehicle (CV) Messages



Michigan Council on **Future Mobility**

































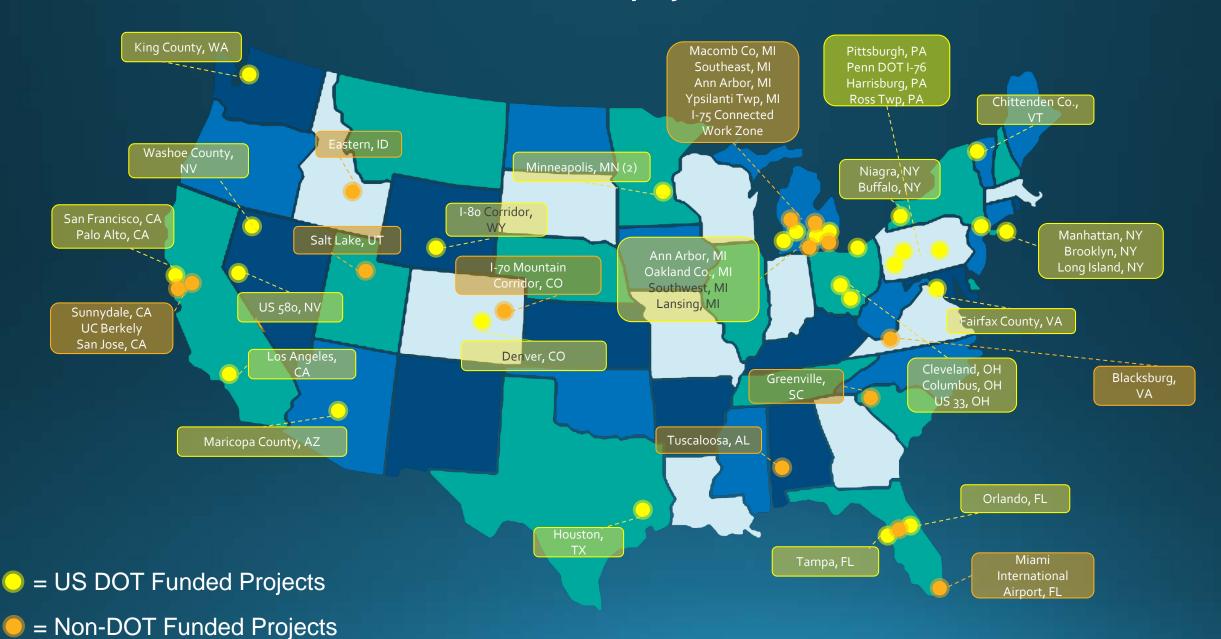
VEHICLE CODE LAW REVIEW







Connected Vehicle Deployment Locations



Coalition for Safety Sooner



COALITION FOR SAFETY SOONER







The Honorable Elaine L. Chao Washington, D.C. 20590

The Honorable Aiit Pai

725 17th Street, N.W. Washington, D.C. 20503

The Honorable Mick Mulyaney



445 12th Street, S.W. Washington, D.C. 20554



















(GHz) Dedicated Short Range Communications (DSRC) Spectrum for safety critical, life-saving transportation applications. DSRC is uniquely configured to enable continuous, low latency, and secure data exchanges between vehicles and the roadway infrastructure to support safety-critical applications. Connected Vehicle technologies based on DSRC have the potential to provide benefits, including increasing mobility, reducing crashes, and most importantly saving lives. DSRC communications technology is ready to deploy now.

The Transportation Infrastructure Owner and/or Operator (IOO) signatories of this letter strongly support the protection, and accelerated utilization of the 5.9 Gigahertz

Dear Secretary Chao, Director Mulvaney, and Chairman Pai:

IOOs throughout the country are actively deploying infrastructure, and developing Vehicle-to-Infrastructure (V2I) applications that are designed to utilize DSRC infrastructure to enhance road safety, reducing crashes and fatalities. These deployments include the implementation of a number of safety critical applications, including Red Light Violation Warnings, Reduced Speed Zone Warnings, Curve Speed Warnings, and Spot Weather Impact Warnings. These deployments include expansions of the Safety Pilot Model Deployment in Ann Arbor, large Pilot Deployments in New York City, Tampa, and Wyoming, the Smart City Challenge in Columbus, and smaller, but significant efforts in 26 states and cities in response to the American Association of State Highway Transportation Officials "SPaT Deployment Challenge." Enclosed are detailed descriptions of IOO deployed DSRC infrastructure

The active deployment and investment in DSRC infrastructure by IOOs has created a diverse industry that has responded aggressively in support of these technologies. Examples include: the inclusion of DSRC technology in traffic signal controller hardware, standardized DSRC Roadside Units, aftermarket DSRC On-board Units and a wide range of Connected Vehicle service providers supporting infrastructure deployment, application development, and integration services



- Message: DSRC is available today to save lives
- Waiting for the next technology is a missed opportunity
- Addressed to relevant Federal Decision makers



Cooperative Research





VEHICLE TO INFRASTRUCTURE DEPLOYMENT COALITION







TRANSPORTATION RESEARCH BOARD

The National Academies of SCIENCES • ENGINEERING • MEDICINE

Questions?



planetm

MICHIGAN

GLOBAL LEADER IN AUTOMATED TECH

GLOBAL
OR NORTH AMERICAN
R&D HQ's

ORIGINAL EQUIPMENT MANUFACTURERS

CONCENTRATION IN ENGINEERING TALENT

UNRIVALED

AUTOMOTIVE MANUFACTURING RESEARCH & DEVELOPMENT



What is PlanetM, anyway?

In spring 2016, the PlanetM **brand** was born to showcase <u>mobility</u> efforts and assets in <u>Michigan</u>.

A year later, the State built on the early success of PlanetM by growing beyond its awareness-focused advertising campaign into a full-service statewide **business development** program.

Today, we do three things.





COMMUNICATE, COLLABORATE

- Policy: Council on Future Mobility
- Industry Development: PlanetM Advisory Board
- Asset Collaboration: MI Mobility Steering Committee
- Economic Developer Collaboration: Mission Control
- City Alliances: [Coming Soon]





planetm

MATCH MEETINGS & MEETUPS

- 1800+ 1:1 connections made since January 2018
- Connections between startups, corporates, investors, academia, public sector and more from over 20 countries
- Over \$13M in follow-on funding from 350 Automobili-D match meetings alone





PLANETM LANDING ZONE

















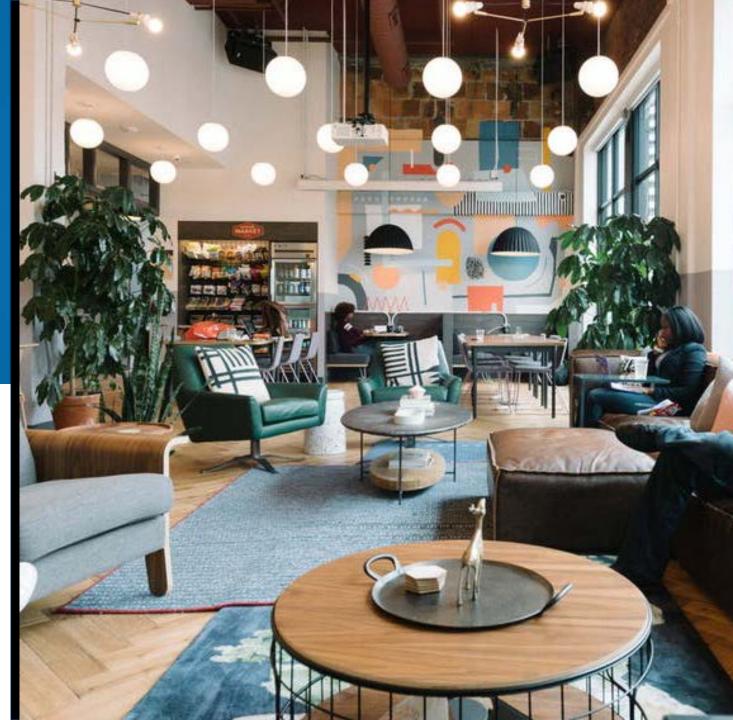












Plug & Play Detroit Summit

BY THE NUMBERS

- July 11 @ Little Caesar's Arena
- 400+ attendees
- 170+ one-on-one match meetings
- 40+ exhibits/demos
- 19 startup presentations
- 4 mobility asset presentations (MDOT, ACM, Mcity, Kettering)
- 3 university presentations



PLUGANDPLAY planeton



planetm

PLANETM STARTUP GRANTS





PlanetM Startup Grants

Mobility startups now have access to \$1.3 million in funding through the PlanetM Startup Grants. The two-part program includes a PlanetM Pilot Grant and a PlanetM Testing Grant.

What: Testing Grant

Amount: \$300K

Who: Mobility startups

Where: Mcity, ACM, Kettering

When: October 2018 - September 2019

How: Apply at planetm.com/grants

Details: PlanetM will pay up to 75% of the

cost to test. Max \$ per startup

(varies per test site).

Deadlines: 1st of every month

What: Pilot Grant

Amount: \$1M (goal 10 pilots)

Who: Mobility startups

Where: Anywhere in Michigan

When: October 2018 - September 2019

How: Apply at planetm.com/grants

Details: PlanetM will pay up to 75% of the

cost to pilot. Max \$ per startup

(varies per pilot).

Deadlines: Oct 1 >>> Feb 3 >>> Jun 2





CITY OF TOMORROW CHALLENGE

Partners: PlanetM, Ford, City of Grand Rapids, Mobile GR & The Right Place

Goals: Launch a pilot process that engages citizens & tech providers to deploy new mobility solutions.

Process: 108 proposals under review; steering committee will narrow to 12 finalists; winner announced Nov 27.



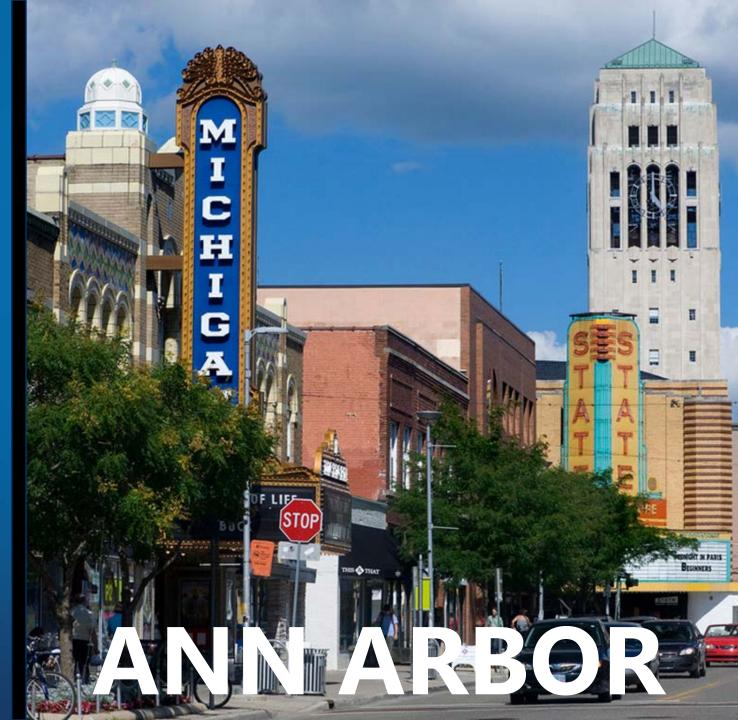


ANN ARBOR MOBILITY TRANSFORMATION PROGRAM

Partners: PlanetM, City of Ann Arbor, DDA, UM, AAATA, Ann Arbor SPARK, AECOM, Deloitte, Ford

Goals: Create an urban data platform to better understand mobility priorities for Ann Arbor & help launch relevant pilots.

Process: 90-day review completed; review committee to select pilots in Oct-Dec; deploy Jan-Sept 2019







PROJECT KINETIC

Partners: PlanetM, City of Detroit, BCG, Quicken, Bedrock, DTE, GM, Lear & NEI

Goal: Create real-world mobility pilot deployments that will make it easier, safer and cheaper to move around.

Process: Phase I completed Spring 2018; Phase II underway & to be completed by June 2019





PROJECT KINETIC OPERATING PLATFORM

SUPPORT THE DEPLOYMENT OF SIX PILOTS BY CONNECTING CONCEPT OWNERS TO RESOURCES, CAPITAL, TALENT, PARTNERS, ASSETS AND OPPORTUNITIES THAT MOVE EACH CONCEPT FROM PILOT TO SCALE



























Neighborhood Mobility:

Improve mobility offerings for Detroit residents who live in low-income, low-density areas and use public transit to get to work, appointments & errands.



Downtown Accessibility:

Improve traffic conditions and parking offerings for Detroit residents and employees who commute to the city for work or major events



EV Utilization & Education:

Optimize the utilization of EV infrastructure and educate about EV technologies for Detroit residents and visitors



Traffic Safety:

Build a future technology infrastructure that will reduce the number of traffic fatalities for Detroit pedestrians, bikers, drivers and riders

BY THE NUMBERS:

- 10 public, private & philanthropic partners
- 100+ hours of interviews
- 4 areas of need
 - Neighborhood mobility
 - Downtown accessibility
 - Traffic safety
 - EV utilization & education
- 120+ concepts identified
- 6 solutions to be deployed as pilots

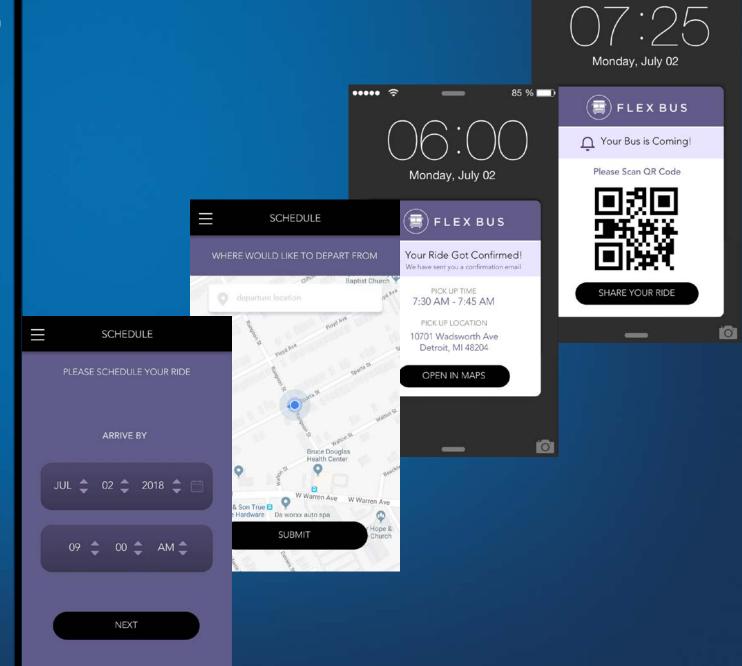






A dynamically routed shuttle that get Detroiters to work on time

Lead: City of Detroit









A car-sharing program that will provide low-cost vehicle access to Detroiters to get to key destinations through features that encourage responsible driving, and lower insurance fees and operating costs.

Lead: City, GM









Hang out. Charge. Engage.

A public space in the heart of Detroit where residents and visitors can enjoy while fast-charging their electric vehicles, and where they'll learn about the benefits of EVs and other state-of-the-art automotive technologies.

Lead: City, DTE, GM









ParkDetroit. The only parking app in Detroit.

A parking platform that integrates dynamic pricing with a perks program to help Detroiters find parking at lower prices while fostering economic development and reducing congestion.

Lead: City, Quicken, Bedrock



PARK YOUR CAR

Scan Your QR Code to Get In

Your Reserved Spot is

214 on level 2

You are the Gold Member

1200 pt

ints away to get one-day free parking

Andiamo

DASHBOARD

HOURS PARKED

Timer

2h 13m 34s

Your total fee so far

DO YOU WANT TO LEAVE?

[+ 65 points]

APPETIZE







Fewer Red Lights. Fewer delays.

A traffic management system employing connected technology to provide priority to transit vehicles at signalized intersections.

Lead: City, Lear









The brain of Detroit's mobility.

A central intelligence hub that sources data from various infrastructure, vehicle, and mobile device sources to enable the development of initiatives to address safety and operational issues on Detroit's street network.

Lead: City, GM



